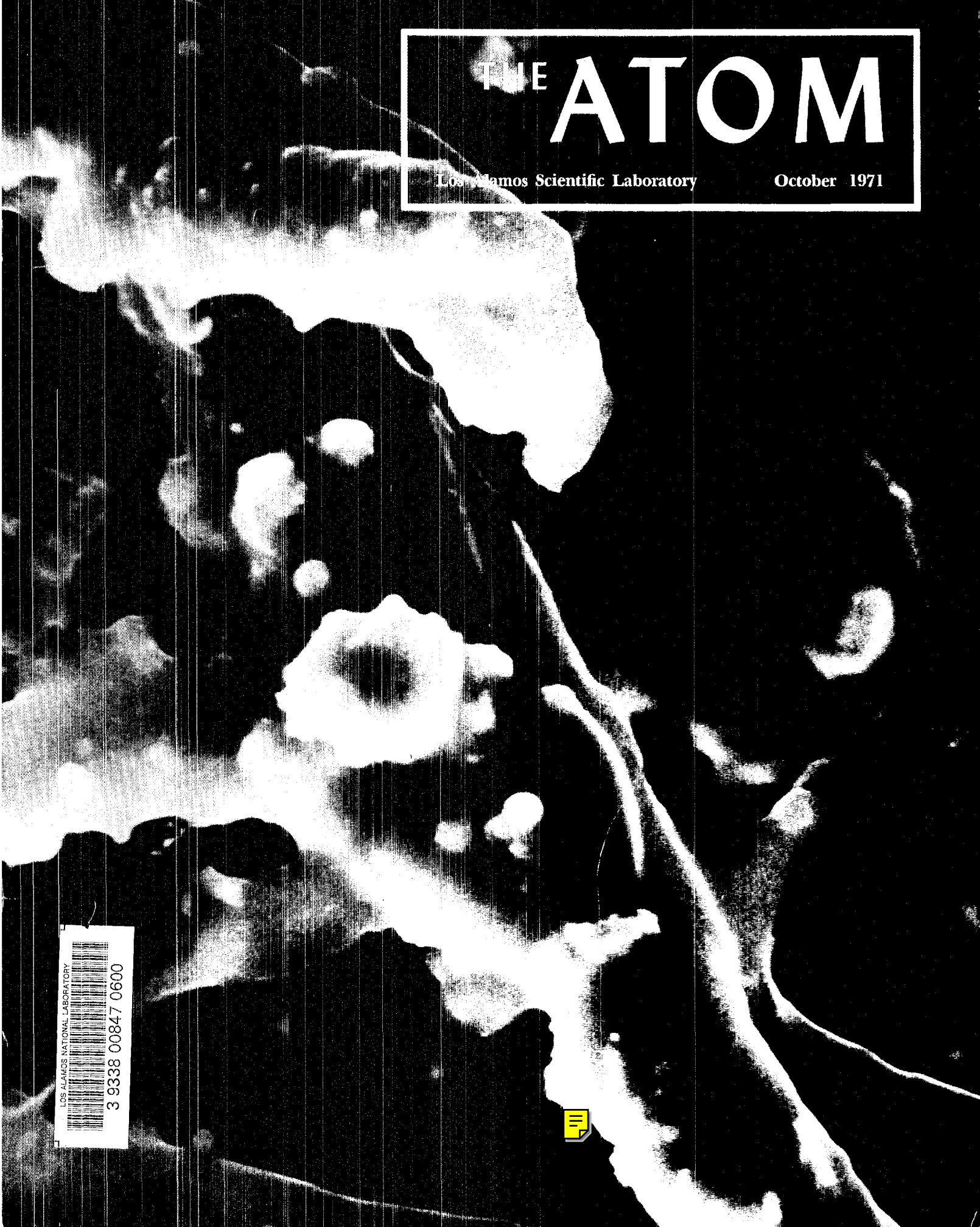

THE ATOM

Los Alamos Scientific Laboratory

October 1971

Volume 8 Number 8
October 1971

THE ATOM

Published monthly except for July-August and January-February issues by the University of California, Los Alamos Scientific Laboratory, Office of Public Information, P. O. Box 1663, Los Alamos, New Mexico 87544. Second Class Postage Paid at Los Alamos.

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Office: D-413 Administration Building. Telephone: 667-6102. Printed by the University of New Mexico Printing Plant, Albuquerque.

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COVER:

The cover photograph shows particles impacted on the fibers of a filter as seen greatly magnified by the CNC-11 scanning electron microscope. Photographs such as this are useful in determining size, shape and distribution of particles for an environmental air sampling project under way at the Los Alamos Scientific Laboratory. For more information, see the story which begins on page eight.

How to Do Business with the Laboratory

Minority and small businessmen look at display items in the LASL warehouse.

How to do business with the Los Alamos Scientific Laboratory was the focal point of a recent Laboratory-sponsored meeting for minority and small businessmen. Although original forecasts had projected an attendance of about 50 persons from throughout New Mexico, there were more than 100 including some from neighboring states as well.

According to Robert Van Gemert, who heads the LASL Supply and Property department, the meeting had three purposes. One of these was to make the Laboratory aware of previously unknown capabilities within New Mexico. Another was to make businessmen aware of Laboratory needs. The third purpose was to inform businessmen on types of products and services to which their capabilities might be adapted, and on how to go about selling them to the Laboratory.

"In the prime contract which the University of California has with the Atomic Energy Commission," Van Gemert said, "we are committed to show an aggressive attitude with respect to small business, and we are well above the national average for steering business toward them. Last year the Laboratory spent about $30 million for commercial products. Of this, $4½ million was spent with small business in New Mexico. We want to improve the ratio.

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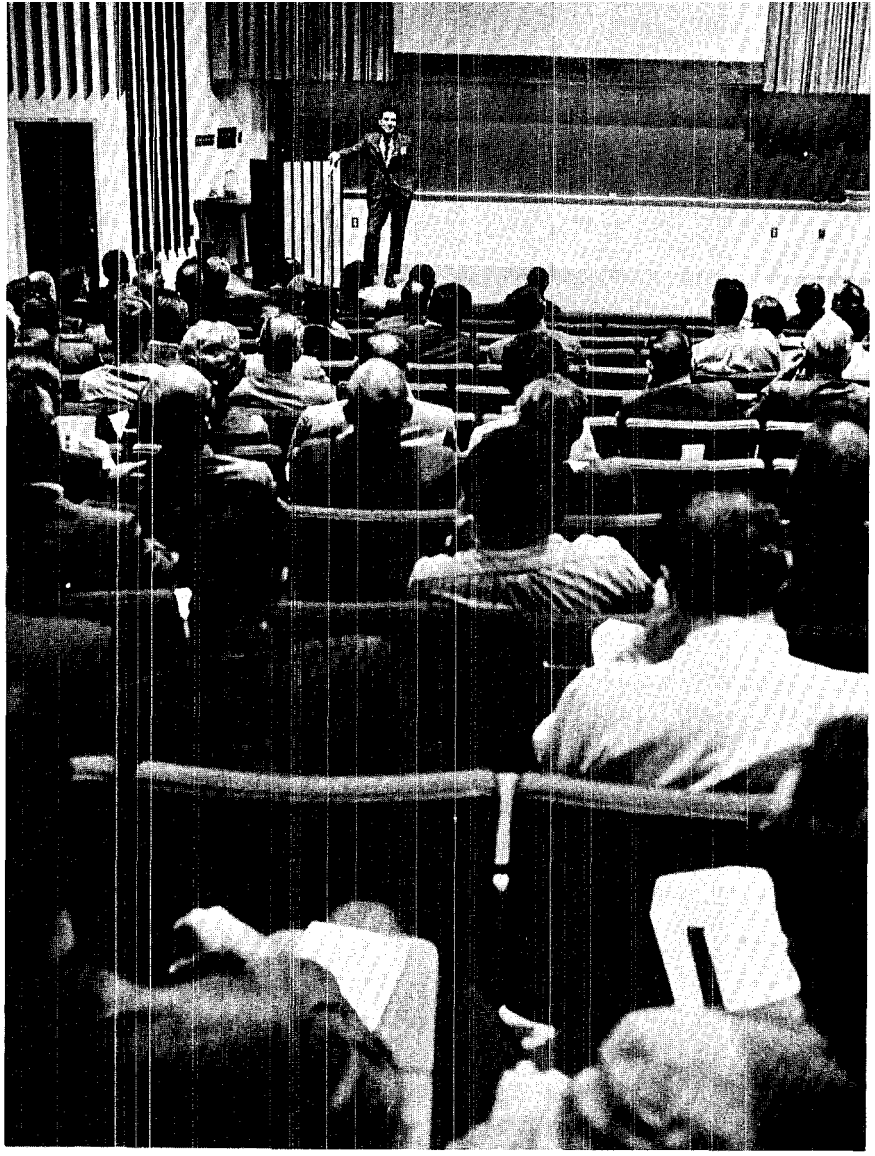


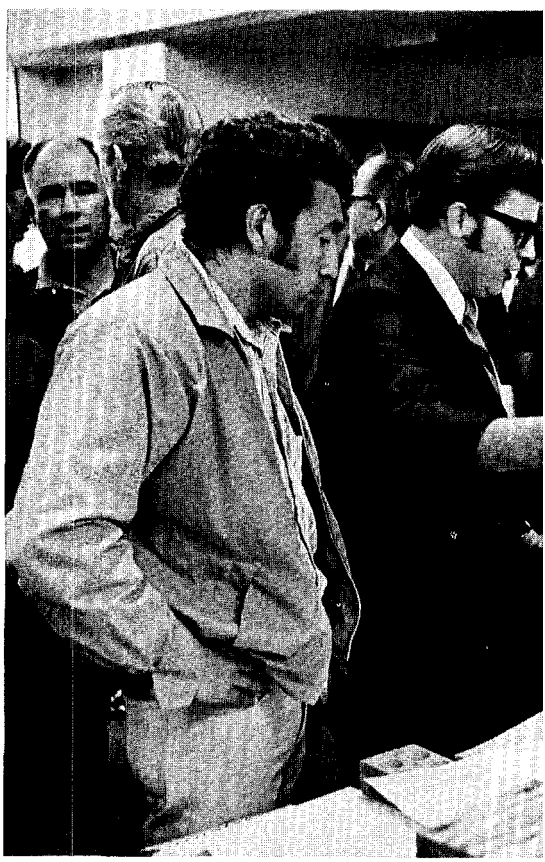
Above, Robert Van Gemert, head of the Supply and Property department gives the introductory talk at the business session.

"We hope to assist in eliminating local pockets of unemployment in New Mexico by doing more business with smaller operations in the state. No other AEC contractor has taken on such a program, on its own, as the Laboratory has through this meeting.

"We're not talking about issuing contracts for building maintenance and repair work for the Laboratory. These are necessarily excluded services because the Zia Company is under AEC contract to do this work. We're trying to find the guys who can do small jobs like building wooden stands, metal fabrication and machining, welding of small parts, assembly of electronic components, making and mending laboratory protective garments, and to supply hardware and other stock items."

Persons who showed intentions of attending the meeting were asked to bring samples, brochures, sketches of products and specialties, or any other information about

Above, Elias Benavidez, Albuquerque, and Gene Willbanks, Los Alamos, register for the meeting. Assisting with registration was Peggy Borders, SP-10.



Below, Tony Ferrera, Raton, looks at one of the machined items on display.

their capabilities. In addition, there was room on the registration form for the businessmen to describe the products and services they have to offer.

"We have a master catalogue library in which perhaps 10,000 to 15,000 vendor catalogues are filed," Van Gemert said. "The information we have received from those attending the business meeting will also be filed there. Then, when the Laboratory requires something, vendors who have the capability we need are invited to bid on it. A businessman's chance to bid on something is based on the information he gives us."

In addition to having their information on file in the master catalogue library, Van Gemert noted that it will be distributed to Supply and Property department buyers, to

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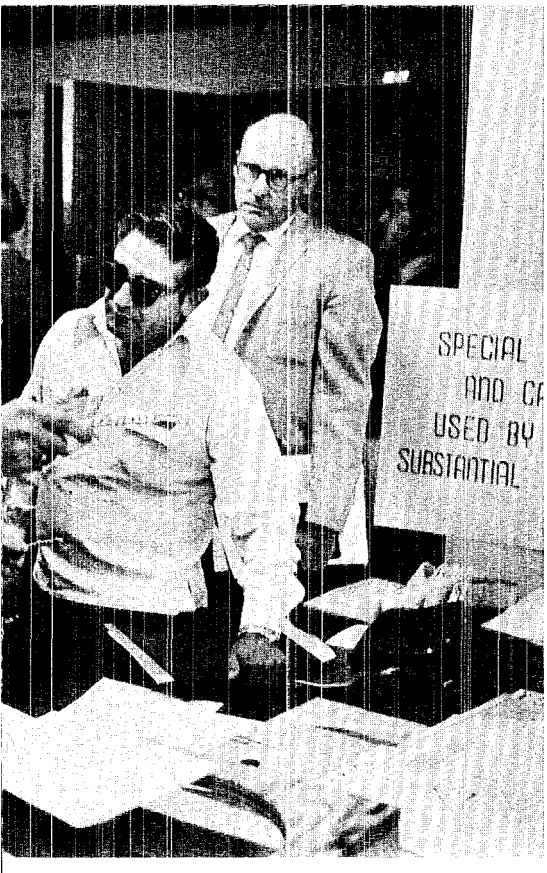
Above, SP-DO's Tom Mannon, right, talks with Fred Nevarez, Las Cruces, and Moses Sanchez, Albuquerque, both of whom are representatives of Minority Enterprises, an arm of the Small Business Administration.

Businessmen take a coffee break which was catered by Group ISD-2.



Ronald Brock, SP-11, talks with Chris Delgado, left, and Gilbert Vargas, both of Espanola, about construction of shock cords.

Lupe Guthrie, SP-10, one of the featured speakers at the business session, talks with Bill Hall, Albuquerque, during the coffee break.

Jose Montoya, SP-3, conducts a tour of businessmen through the LASL warehouse.

Persons attending the minority and small businessmen's meeting were bussed to the warehouse because of inclement weather. They are shown here climbing the ramp onto a loading dock at the warehouse.

technical personnel at the Laboratory, and to other AEC laboratories and government agencies who also may have use for the information.

The meeting was divided into two parts. The first part was a business session at which Van Gemert called on various members of the Supply and Property department for short talks relative to the Laboratory-business relationship. Jack Halliday, SP-12, talked on "Vendor Liaison;" Lupe Guthrie, SP-10, "Securing Quotations and Purchase Orders;" Don Bryson, SP-DO, "Specifications;" Newby Ellington, SP-11, "Drawings, Fabrications, Quoting Periods, Laboratory-Furnished Equipment or Material;" Clarence Lithgow, SP-11, "Areas of Special Interest;" and Ed Wortmann, SP-11 group leader, "Supplies, Materials and Services Used by the Laboratory."

In addition to the series of talks, businessmen were invited to talk individually with Supply and Property department members present at the meeting. Several copies of the Laboratory's stock catalogue, containing more than 30,000 items, were placed in convenient locations to familiarize businessmen with regularly stocked items. There was also a display of 80 various types of items representative of the Laboratory's unusual requirements which were fabricated by commercial businesses.

The second part of the meeting included a tour of the Laboratory stores and warehousing. Clyde Reum, assistant department head, discussed with the businessmen the Laboratory's system for receiving, storing and issuing thousands of items. There was also a display of products used at the Laboratory.

Naturally Occurring Plutonium-244 Discovered by LASL Scientists

By Bill Richmond

Suppose you flew over the Grand Canyon at night.

And dropped a pebble that was almost identical to all others in the area.

And then, years later, tried to find that pebble.

Simple—compared to what scientists from the Los Alamos Scientific Laboratory recently accomplished.

This was the discovery, for the first time in nature, of the most stable isotope of plutonium: plutonium-244.

Plutonium-244 was first made artificially and identified in debris from the world's first thermonuclear explosion—code-named "Mike"—which was conducted by LASL in 1952. The rare isotope is now produced in high-flux reactors.

The barely detectable amount of plutonium-244, about 20 million atoms or less than a hundred-millionth of a microgram, was chemically isolated by Darleane Hoffman and Francine Lawrence, both of CNC-11, from an organic solvent concentrate provided by Molybdenum Corporation of America. The solvent represented the processing of nearly 200 pounds of bastnasite ore from Molycorp's Mountain Pass mine in Southern California.

Jack Mewherter and Frank Rourke at Knolls Atomic Power Laboratory (KAPL), Schenectady, N.Y., performed the measurements which identified the existence of the mass 244 plutonium isotope.

It all began several years ago in conversations between Mrs. Hoffman and George Cowan, CNC-division leader.

Natural heavy elements are presently believed to be made in part by the explosion of a supernova—a massive star—in the following way: In seconds the supernova collapses upon itself and then explodes; near the center of the supernova is a very high density of neutrons which forms the heavy elements; when the giant star explodes it ejects into space considerable quantities of the heavier elements which can be captured by nearby stars and later incorporated into their planets. It is possible that the natural plutonium-244 found on earth was made in this way in a supernova which exploded in our galaxy about five billion years ago.

Plutonium-244 has a half-life of 80 million years, with thorium-232 being the final decay product of the isotope. Thus, if all the thorium-232 on earth today came from plutonium-244 it would be possible to calculate the maximum amount of plutonium-244 present at the time the earth was formed. This would necessarily be the maximum amount because not all thorium-232 is created this way. Nevertheless, this is a good reference point and indicates the necessity for processing large amounts of material enriched in plutonium.

After calculating the decay of plutonium-244 to the present time, it was concluded that if the last formation of the heavy elements was indeed closer to five billion than six billion years ago, then it should be possible to find the isotope in nature if large enough quantities of ore were processed.

"The problem," Mrs. Hoffman said, "was to find a place where we could get 200 pounds or a thousand pounds or maybe tons of raw ore processed. We started looking around for mining operations where we could get in on the latter stages, after all the heavy work such as mining and processing had been done.

"I heard about Molycorp's mine at Mountain Pass where a large deposit of rare earths was being processed and I arranged a trip to see their operations and talk to them."

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The bastnasite, which is a rare earth fluocarbonate mineral, was taken from a large outcropping of Precambrian carbonate more than 550 million years old. The oldest rocks found in the earth's crust were formed during the Early Precambrian era. Mineral deposits associated with Precambrian rocks have yielded most of the world's gold and nickel in addition to large quantities of copper, silver, radium, and uranium.

"The solvent they were using in their processing operations was the same we have been using in our plutonium analysis of underground debris from the Nevada Test Site so we knew we could process it," Mrs. Hoffman said.

"We asked if we might be able to obtain some of their organic solvent and they donated a few gallons to us."

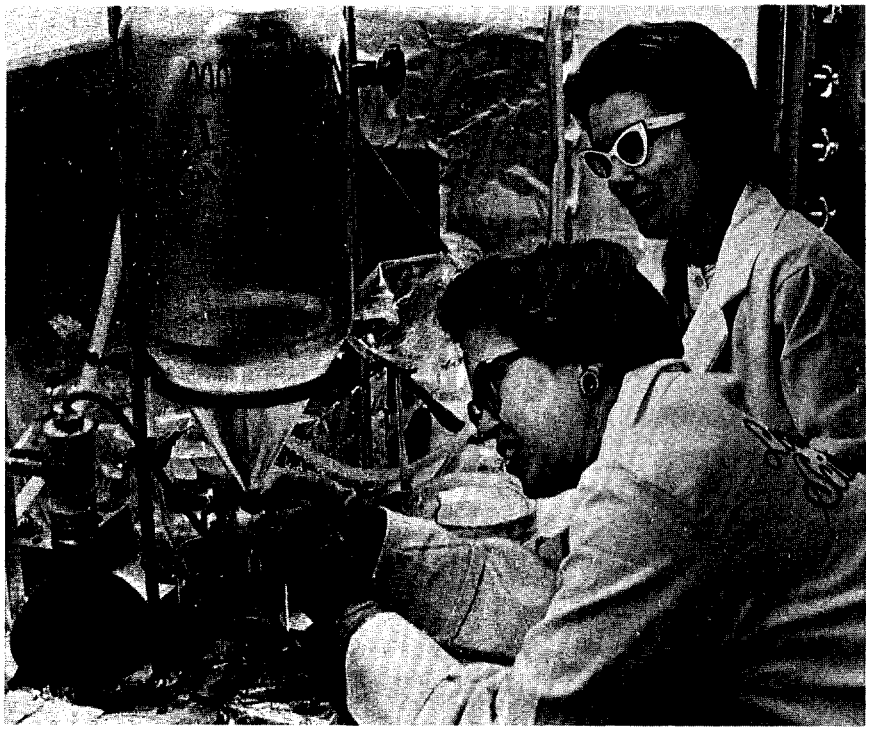
The plutonium was extracted from the solvent, purified, and concentrated.

Although plutonium-244 decays by alpha particle emission, the total amount of the isotope in the sample would emit only one alpha particle in about six years, which is far too low to permit detection by alpha counting. The very sensitive mass spectrometric measurements necessary for positive identification of the plutonium isotope were performed at KAPL.

A mass spectrometer is a device for detecting and analyzing isotopes. It separates nuclei that have different charge-to-mass ratios by passing the nuclei through electrical and magnetic fields.

"KAPL did one more extraction and then placed it in their mass spectrometer," Mrs. Hoffman said. "Actually, they divided our sample in two portions and found plutonium-244 in both fractions."

The search for plutonium-244 was never the fulltime job of Mrs. Hoffman or Mrs. Lawrence. They squeezed it in around their other work which includes radiochemical analysis of plutonium from NTS experiments, and nuclear spectroscopy.



Francine Lawrence and Darleane Hoffman work with the organic solvent concentrate in which plutonium-244 was found.

Further experiments are planned and additional samples have been obtained.

"The new solvent has been used in processing 2,500 pounds of ore as compared to the original 200 pounds," Mrs. Hoffman said.

A number of other investigators have looked for the plutonium isotope in lunar samples from Apollo missions as well as in terrestrial material—but heretofore none had been found.

Cosmologists are greatly interested in determining the time when heavy elements were last produced by nature in our "local" universe. Since the half-life of plutonium-244 is relatively short compared to geologic times, the fact that detectable amounts still exist on earth supports the hypothesis that heavy elements were made about the time the solar system was formed rather than much earlier, as had been commonly postulated.

Glenn Seaborg, former AEC chairman and president of the United Nations Atoms for Peace Conference in Geneva, was reported as saying that the discovery "could help determine the planet's age."

Los Alamos United Fund Sets Goal at $68,000

The goal for this year's Los Alamos United Fund Campaign has been set at $68,000, according to Chairman Joe Perry. The campaign will be conducted throughout October.

Of the $68,000 goal, $65,300 will be used to support participating agencies. The remaining $2,700 will be used for operating expenses and to provide an emergency reserve. There are no salaried officers or employees. Local citizens volunteer their time and efforts to collect and distribute funds among various charitable, youth and service organizations. Operating expenses amount to less than two cents of every dollar collected. According to Al Bacon, treasurer of the General Advisory Committee, this expense rate is among the lowest in the communities having United Fund campaigns and includes writing off unpaid pledges from the previous campaign. The emergency reserve is included in the goal to help member agencies meet unforeseen expenses such as those which arise from disasters, and to assist agencies which unexpectedly lose other sources of income.

The Los Alamos United Fund supports 14 agencies. There are no new ones and, the Youth Center, a participant in previous campaigns, has resigned its membership. Agencies designated to receive supporting funds are the Babe Ruth League which will receive $1,000; Boy Scouts, $10,000; Cancer Clinic, $7,300; Chaparral Home, $800; Family Council, $11,000; Girl Scouts, $10,000; Heart Association, $4,250; Little League, $1,000; Red Cross, $6,600; Retarded Children, $5,000; Salvation Army, $7,600; United Services Organization, $750. The Lassie League has again requested no funds this year, and no funds were allocated for the Physically Handicapped. Both agencies, however, remain as participating agencies.

Citizens will be contacted at their places of employment with the exception of the retired citizens and clergy members who will be solicited by J. M. B. Kellogg. David Heimbach, Mail and Records group leader, and Gilbert Ortiz, also of Mail and Records, will conduct the campaign at the Laboratory. Team captains who will assist Heimbach and Ortiz are Pat Schott, who will solicit funds in the Director's office and the Information Services department; John McHale, A-division; Ruby Murry, Accounting department; Margery McCormick and Joyce Harvey, G-division; James Lilienthal, CMB- and CNC-divisions; Bob Donham, Engineering department; Bob Drake, GMX-division; Bob Penland, H-division; Carl Lyon, Jim Wells and Earl Rutledge, J-division; Mary Riggs, MP-division; Bill Kirk, N-division; Frank Tallmadge, P-division; Bob Albertson, Personnel department; Don Morrow, Shop department; Helen Boone, Supply and Property department; Bernice Kelly, T-division; Al Peaslee, TD-division; Floyd Baker, W-division; Howard Smith, Wage and Salary department.

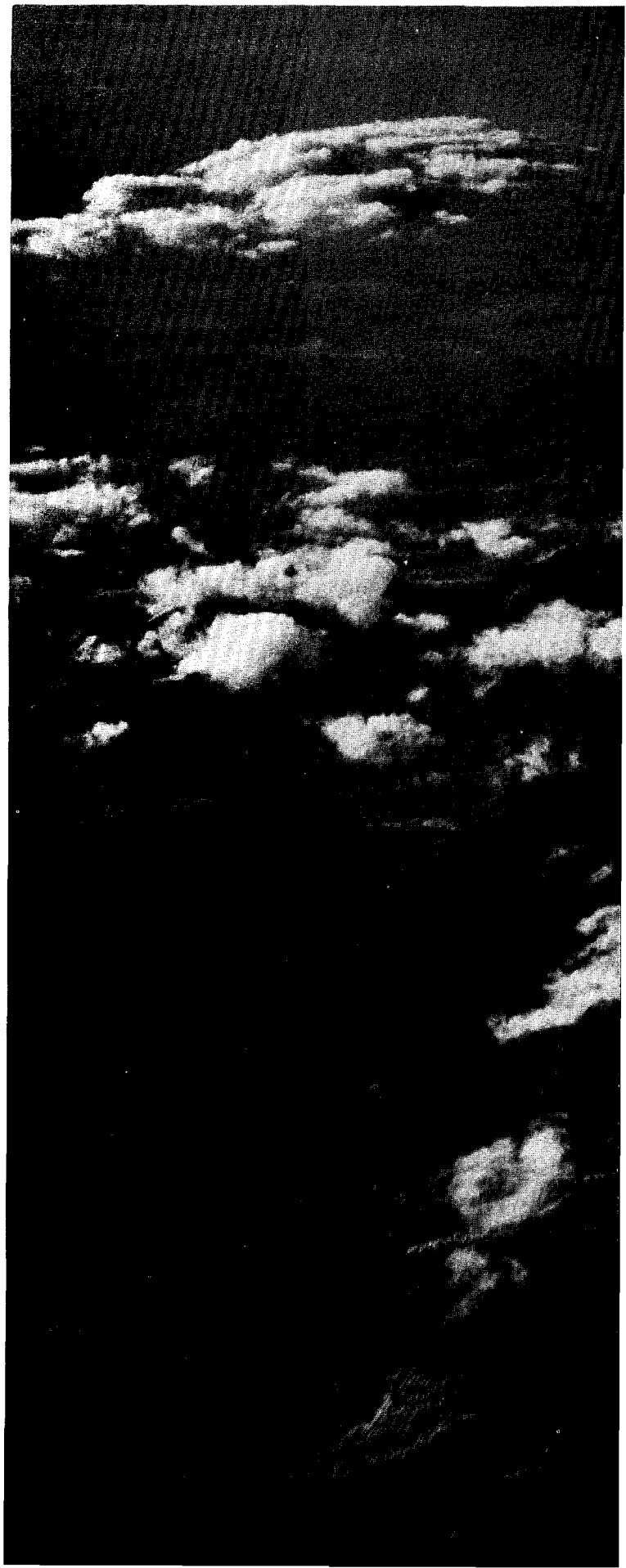
Other team captains are Emmett Armstrong, Zia Company; Harold Valencia, AEC and other government offices; Wilton Parsons, the business community; Gene Pollard, Los Alamos County; Dr. Ann Wadstrom and Carolyn Worthington, Los Alamos Medical Center; and John Reninger, Los Alamos Schools.

Both local banks have again agreed to accept monthly bank deductions as a convenient way for citizens to contribute. Contributions can also be made in cash or on the installment plan. Spaces are provided on the pledge cards for these methods of contributing.

Assisting Perry with the campaign are Bacon; Tallmadge, who is agency coordinator; and Lorraine Thorn and Marty Cole, public relations.

An Air Force RB-57F, used by LASL in the environmental air sampling project, flies above the clouds near the Valle Grande, shown at upper right.

'Fingerprinting,' the Airborne Way



Technology sometimes has a disturbing way of creating new problems while solving old ones. Industry, for example, in response to the seemingly unlimited desires of the American people, has been pumping hundreds of new products into the marketplace every year. This growth has handily outdistanced the development of methods needed to control the by-products of manufacturing which are major contributors to our increasingly polluted atmosphere.

For centuries the impact of the combustion process, which is widely used in industry, has been relatively unimportant. But population, and the desires of this population for better living standards, has been growing at the expense of our environment until, in recent years, air pollution has reached critical proportions. Smog clouds the sky, especially over many of our large metropolitan industrial centers and there is a technological scampering to find ways of eliminating it.

It might have been the public's environmental awareness that suggested a new way of obtaining information for a vital study that has been under

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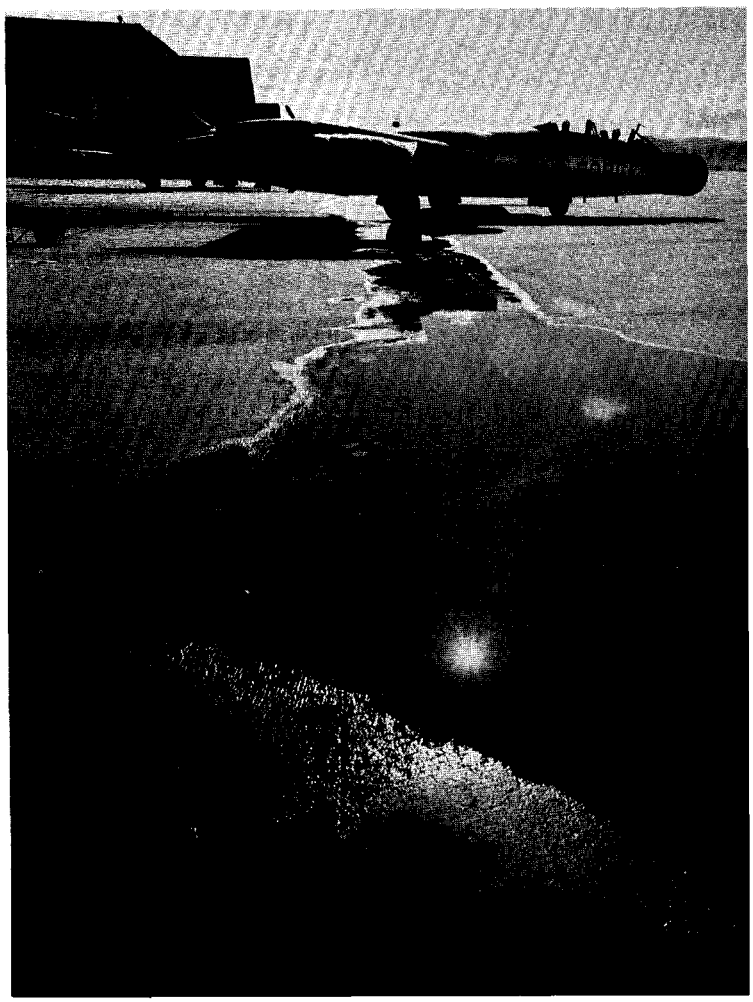
way at the Los Alamos Scientific Laboratory for several years. This is an air sampling project sponsored by the Atomic Energy Commission's Division of Military Application. The principal investigators are a small team of scientists in Group CNC-11 who are supported by men and aircraft of the 58th Weather Reconnaissance Squadron at Kirtland Air Force Base in Albuquerque.

The project is aimed at maintaining and improving the equipment and techniques for sampling and analyzing nuclear debris in the atmosphere. Effective and reliable airborne sampling devices and radiochemical analytical techniques have been developed for this purpose over a period of several years. But, experiments to advance the state of the art of aircraft sampling have been limited considerably since the signing of the Limited Nuclear Test Ban Treaty in 1963.

Two years ago LASL scientists proposed to the DMA that atmospheric emissions from industrial sources might be a good simulator for nuclear debris since both are in essence a mixture of particles suspended in air. In addition, sources of particulate emissions in New Mexico and other regions of the southwest are distinctly separated from one another in a relatively clean environment. This factor would provide an "open laboratory" where equipment and analytical techniques could be tested against particles with varying characteristics without having to worry about a sample being contaminated by other sources.

The DMA sanctioned a limited scale exploratory program to determine the appropriateness of existing equipment and techniques of analysis in this environmental area. Its members and the Los Alamos scientists were keenly aware that in addition to providing information valuable to the DMA project, the study of industrial wastes could be of extreme importance to other agencies. For example, if by collecting and studying emissions from a particular source, the particles proved to be characteristically different than those emitted by other sources, enforcement agencies would have proof of principle that air polluters can be "fingerprinted." By lifting "latent fingerprints" from a smog layer they could be related back to their source. The information would also be useful to meteorologists who have an interest in the association of air currents with the dispersion and deposition of particulate matter. Industry itself could be interested from the standpoint of plant location and the installation of proper filtering devices.



An RB-57C leaves its apron at Kirtland Air Force Base for an air sampling mission. The sock on the wingtip sampler is removed at the end of the runway just prior to takeoff.

Since beginning the environmental project, members of CNC-11 have collected and analyzed samples from 28 sources of 12 different types including copper, iron and zinc smelters; power, carbon black and chemical plants; potash, perlite and gypsum plants and mines; sawmill waste burners and even such naturally occurring phenomena as forest fires.

Although statistically short of "proving beyond a reasonable doubt," the samples analyzed to date indicate that emissions from each source are characteristically different from any others. More recently the scientists have begun analyzing samples collected downwind where emissions from more than one source come together and mix. According to Paul Guthals of CNC-11, this part of the investigation indicates that latent fingerprints can be lifted from a smog layer.

Guthals is responsible for liaison between the Laboratory and the Air Force. He also serves as an airborne scientific observer on some of the sampling flights. Air Force Captain Russell Glenn who is attached to CNC-11 as a military staff member also serves as a scientific observer and is responsible for the improvement of both ground support equipment and airborne sampling instruments and techniques. Ted Norris of CNC-11 serves as an observer occasionally, although he is heavily involved in other responsibilities of the group.

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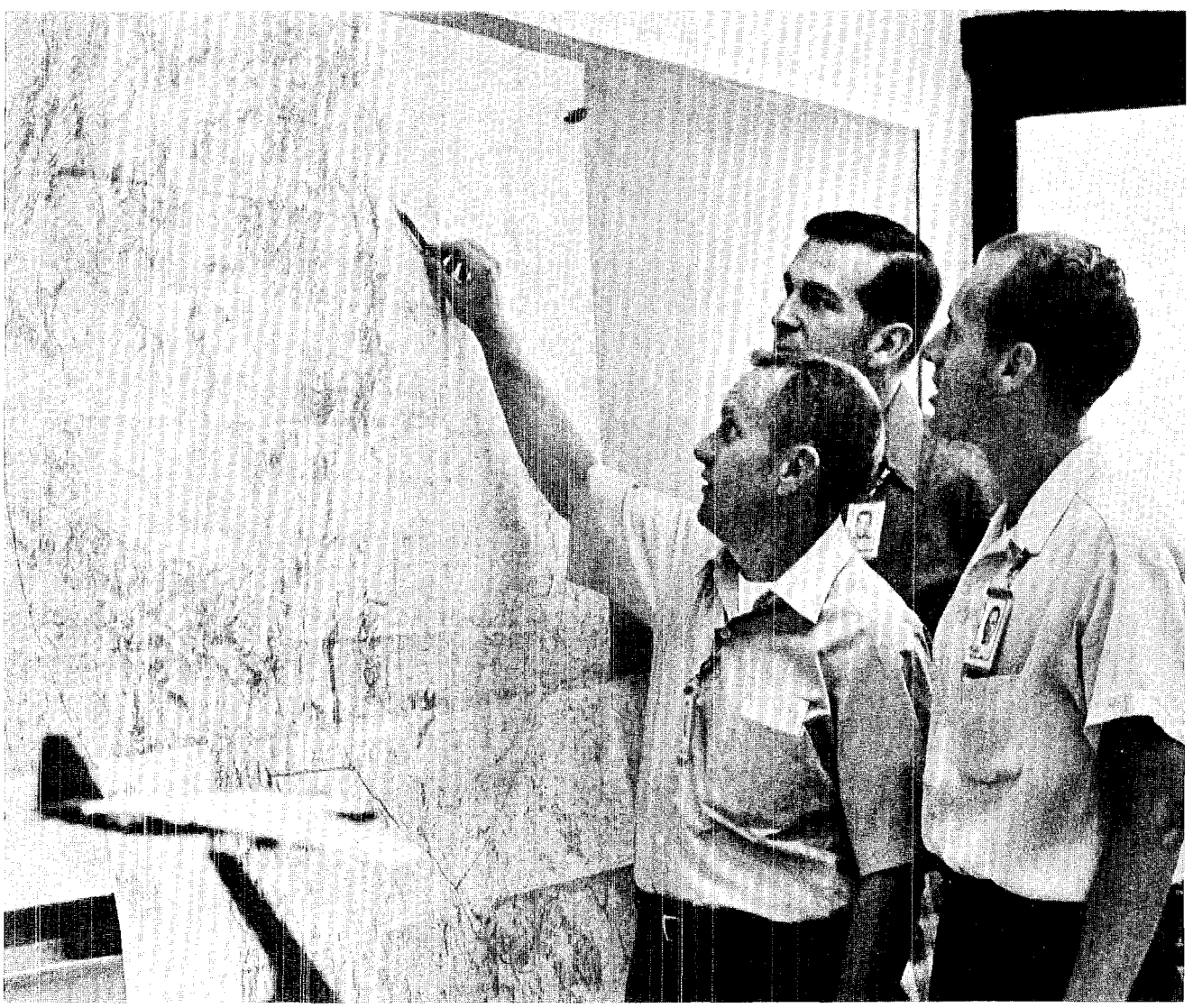
The Laboratory's three scientific observers plan a sampling mission. They are Paul Guthals, Captain Russell Glenn, and Ted Norris.



Joe Breslin, EG&G, Albuquerque, inserts a filter in one of the wingtip samplers. Guthals folds the plastic bag used to protect the filter from ground contamination prior to insertion.

Captain Russell Glenn receives some help with his cockpit harness from Sergeant Roy Johnson at Kirtland Air Force Base.

Guthals gives last minute instructions before a flight. In the foreground are Cedric Drake and Breslin, both of EG&G, Albuquerque, who support the air sampling project. To the left of Guthals is the mission's Air Force pilot, Major Ed McGee.

Under the command of Colonel Click Smith, Jr., members of the 58th Squadron fly RB-57C and RB-57F jets which are specially instrumented for air sampling missions. The C model is used at low and medium altitudes, while the larger and more powerful F models are employed for missions at altitudes above 40,000 feet. The excellent range capabilities of the RB-57's permit great flexibility in sampling missions. The aircraft can loiter on station for relatively long periods of time if necessary for the collection of samples at distances within a 400- to 500-mile radius of Albuquerque.

The missions flown for the LASL project are directed by the scientific observer who is also responsible for the collection of samples. Two LASL-designed, wing-mounted filtering units operated by the observer from the cockpit of the aircraft are used to take samples. These units consist of aerodynamic-shaped tanks, each containing a filter paper 29 inches in diameter. Particulate matter from a source is captured by impaction on the fibers of these filters.

The filter paper was designed for high altitude sampling of nuclear debris. Little was known about its efficiency at lower altitudes and slower

air speeds, Guthals said, until Harry Ettinger and Ron Stafford, both of H-5, conducted tests which showed it to be better than 80 per cent efficient at the air speeds used in low-level flights for the environmental project.

Prior to each flight, the filtering units are cleaned and the valves which expose their interiors are closed to prevent the entry of ground contamination. As a further precaution, the units are covered with a plastic "sock" until just before takeoff.

When the plane reaches its destination, the Air Force pilot manuevers the aircraft according to the observer's directions. The observer opens the valves of the filter units long enough to collect samples of particles emitted by a source and then closes them before leaving the sampling area so that extraneous particles from other sources are not picked up during the flight back to Kirtland.

At Kirtland the filters are removed and placed in air-tight plastic bags. They are taken to the Laboratory where they are subjected to neutron activation analysis and scanning electron microscopy techniques.

Neutron activation analysis is done by CNC-11's Bill Sedlacek. It is used to determine the overall chemical composition of the particles collected on the filter papers and is especially effective in isolating trace elements. The sample is bombarded with thermal neutrons. By absorbing these neutrons, the elements present in the sample become radioactive and start to decay. In the process of decaying most elements produce gamma rays. The energies of these gammas are characteristic of the elements emitting them. By measuring these energies, the elements present in the sample can be identified.

Neutron activation analysis techniques have been used since the project began. In the beginning they were complemented with scanning electron microscopy by Tom Gregory of GMX-1. Recently, however, CNC-11 acquired a scanning electron microscope, and its use in the environmental program has been expanded.

The CNC-11 scanning electron microscope is operated by Louise Smith. It has much greater depth of field than conventional microscopes, a factor which allows viewing of particulates directly from the filter paper. The instrument produces a visual image of particles impacted on the filter fibers and, also, energy spectra which can be used to identify elements which are most abun-

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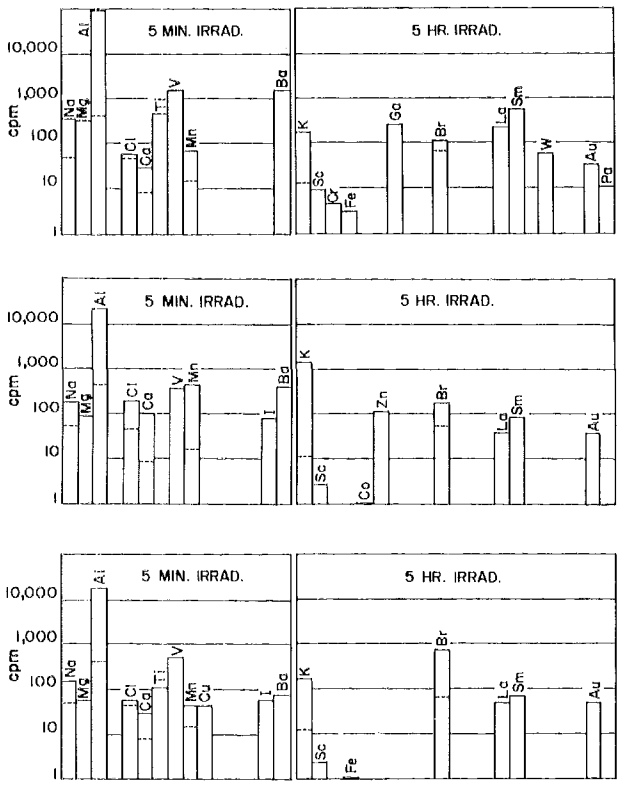
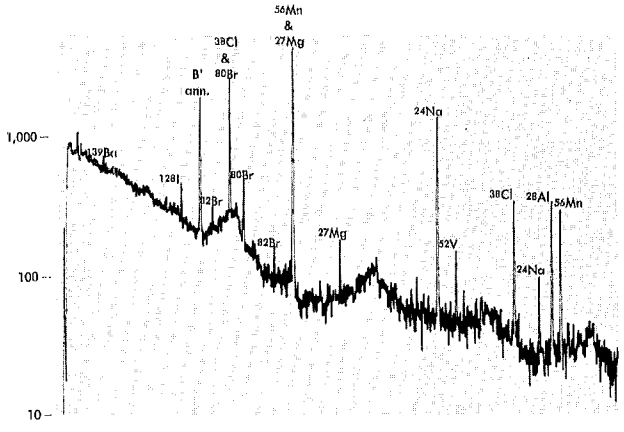


Above are three bar graph profiles representing a synopsis of the appearance of the gamma spectra observed with the neutron activation techniques. Each graph consists of two parts, one showing the count rates from five minute irradiations for short-lived isotopes and, the other showing five hour irradiations for long-lived isotopes. The activity of each isotope is plotted in counts per minute. The top graph represents particles emitted from a power plant. The middle graph is of a sawmill waste burner and the last graph is of an urban area. Below is one of the neutron activation traces of an urban area sample from which the graph above was formulated.



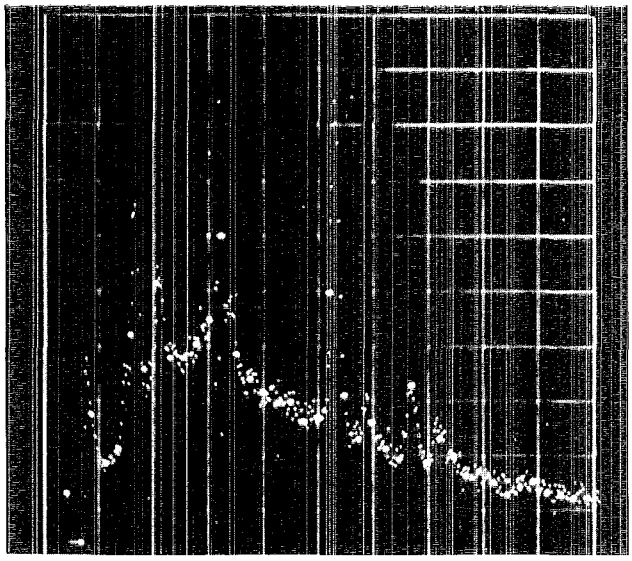
Magnified many times by the CNC-11 scanning electron microscope, particles emitted by a power plant are shown impacted on a single filter fiber.

Louise Smith operates the scanning electron microscope. A magnified visual image of a sample can be seen on the screen at right center.

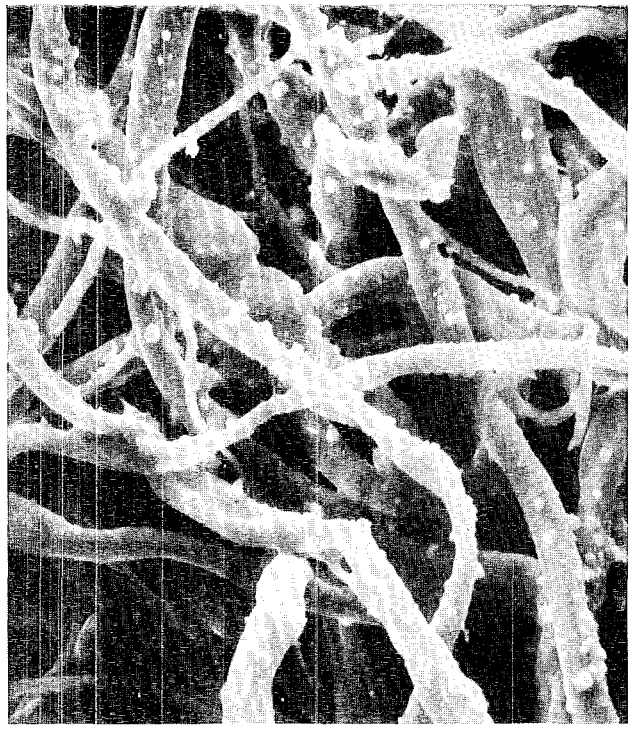
dant in the sample. Electrons are emitted by a tungsten filament and focused on a sample by an optics system. Electrons striking the sample are converted to light, which is used to produce the visual image on a screen. This graphic data allows scientists to see the size and shape of particles and to determine their distribution across the filter. The electron-sample interaction also produces x rays whose energies are displayed on a grid. These energies are compared with known energies that are different for the various elements.

Data from the environmental project has resulted in modifications of the filtering units to improve their efficiency in collecting samples. It has also been shared with various interested government agencies who have jurisdiction within the area where sampling missions have been flown.

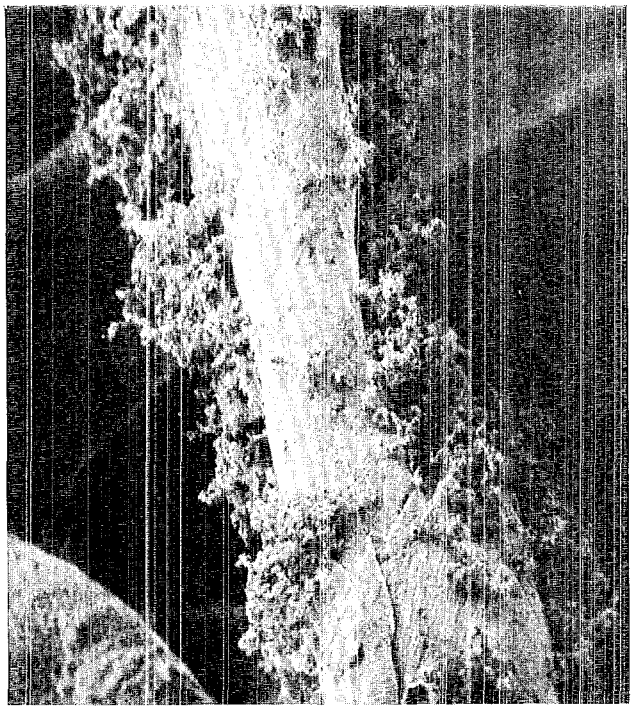
In addition, LASL's experience in environmental sampling has been credited with the Laboratory's participation in two other related events. One of these was a sampling mission over Alaska. It was sponsored by the U. S. Department of Transportation to help determine the environmental effects of the controversial supersonic transport. In this mission both particulate and gas samples were collected from jet aircraft contrails. Since radiochemical techniques are inef-



Above, the x-ray energy spectra produced by the scanning electron microscope can be used to identify elements most abundant in samples. This spectrum was used to identify some of the major elements contained in a sample collected over an urban area. Right, particles from the same urban area are shown impacted on a tangle of filter fibers.



Smoke from a sawmill waste burner appears somewhat like a vine on this filter fiber.



fective in nonradioactive gas analysis, support was provided by other groups in the Laboratory. Instrumental techniques were used by Evan Campbell of H-5 in determining the identity of organic gases and vapors. This work was complemented by Mass Spectroscopist Dan Loughran of GMX-2.

In the other experiment, the CNC-Air Force team worked with the Argonne National Laboratory and several university scientists to determine the effects of air pollutants on inadvertent weather modifications. The study was conducted at St. Louis, Mo., where there has been a notable increase in rainfall downwind from the city. "We collected samples of particulates while flying a track up and down the Mississippi River at St. Louis," Guthals said. Areas above rain clouds were also sampled, he noted, to determine whether or not the boiling action of the cloud formations "kicked any particulates through the anvil top."

It's clear that what members of the DMA and scientists at LASL suspected would happen has happened. The study has generated a great deal of interest among representatives of many agencies who are looking for ways to improve our environment.

Electron Prototype Accelerator Scheduled to be Shut Down December 30

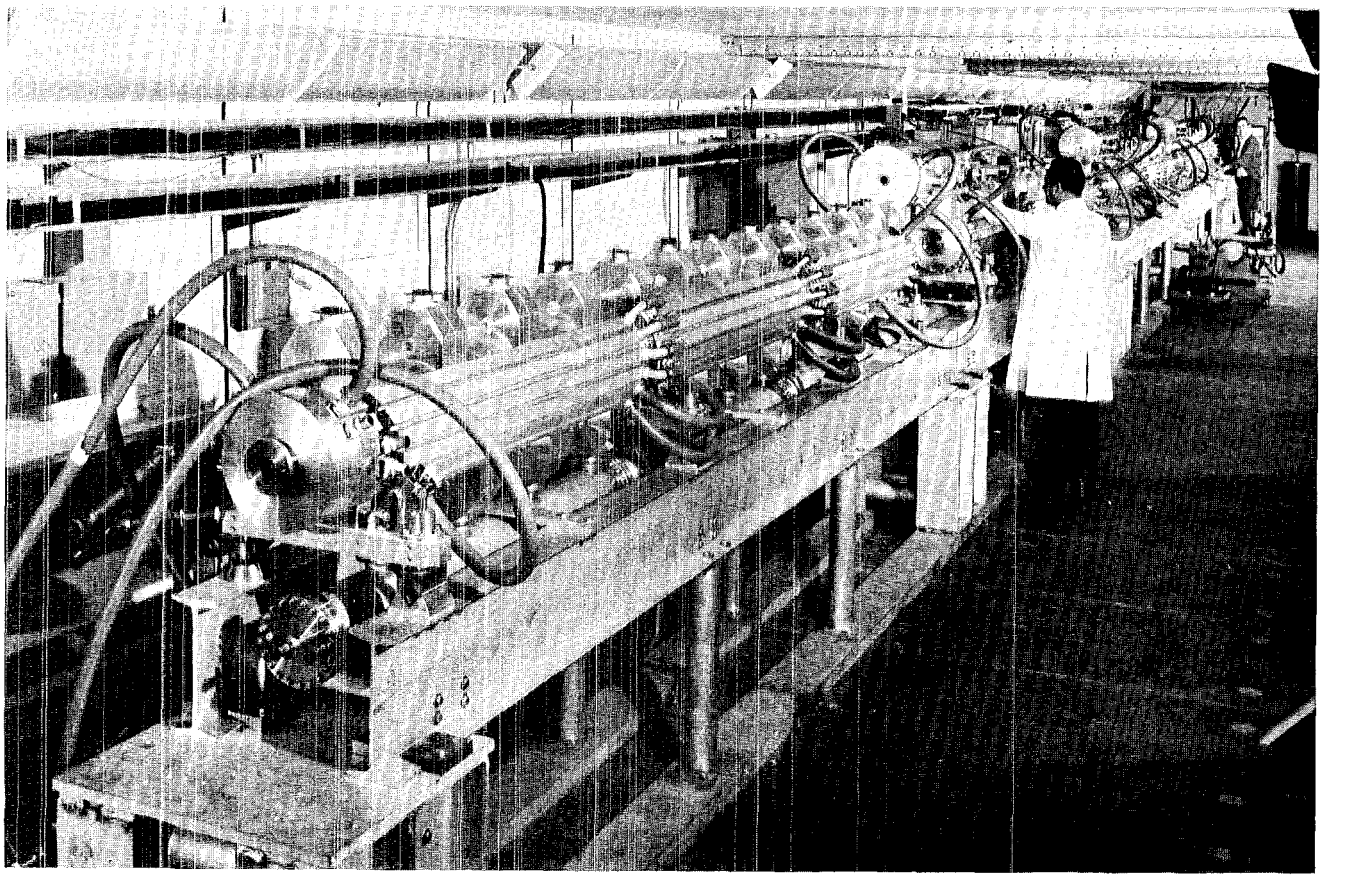
In December, beam time on the Electron Prototype Accelerator (EPA) will be devoted to a series of experiments to study the neutron spectrum from electron-irradiated plutonium. After that the accelerator will be shut down.

Its computer, radio-frequency power system, shielding and some hardware will be moved and put into service at the Los Alamos Meson Physics Facility (LAMPF), and its cavities will be surplused. According to MP-Division Leader Louis Rosen, the projected date for shutting down the accelerator is Dec. 30.

Since it was put into operation nearly four years ago, the machine has been used by MP-division groups to investigate in detail new accelerator-design concepts and many of the problems associated with the building of the LAMPF proton accelerator. It has also been used by many scientists, not only from the Los Alamos Scientific Laboratory, but from several institutions throughout the United States, and from Canada and Australia. Its operation has been booked solidly during the last two and a half years and it has been operating around the clock 30 per cent of the time. To date, experimenters are being asked to reduce beam-time requirements, and there is no time left for any additional experiments other than those planned before the EPA is shut down.

The elimination of the accelerator from MP-division's inventory does not mean the EPA will never run again. It can be acquired from the Atomic Energy Commission's surplus list by another Laboratory division or by some other institution. "It must be remembered, however," Rosen said, "that the EPA was built as a prototype unit. It was not engineered for long term use. If it is to be used beyond the date projected for shutdown, it will have to be renovated extensively."

Aside from the machine's engineering, the division leader noted several other reasons for shutting it down. The EPA's shielding will soon be needed in the experimental areas at LAMPF; budgetary limitations make operation of the EPA an expense the division cannot afford; and the manpower required to operate it is needed at the LAMPF site. "As more and more of the LAMPF accelerator is put into operation, more manpower is needed to run it. The recent successful 211 MeV



The Electron Prototype Accelerator is scheduled to become a surplus item after being shut down Dec. 30.

test a month ahead of schedule made more urgent the establishment of a stronger operating organization. By shutting down the EPA, we can move its manpower to LAMPF."

Another important factor in the cessation of EPA operation is that investigations of the new accelerator technology, which will embody LAMPF, have essentially been completed. The machine was constructed primarily to test the radio-frequency power and side-coupled cavity systems that were totally new and unique in the accelerator field, to produce a beam at full power, to measure the beam's properties and to compare them against design criteria. In addition, the EPA has been used to investigate and develop the most extensive computer-controlled system ever married to an accelerator, personnel and radiation safety concepts, accelerator fabrication techniques, vacuum and cooling systems, and to develop a line of targets that will stand up to the 800 MeV LAMPF beam and meet the requirements of the experiments to be conducted at LAMPF. Target development has not been completed, but experimenters have reached a stage where the 100 MeV portion of the LAMPF accelerator can be used to continue this effort.

Two days before Christmas in 1967, the EPA was turned on and operated at full power for the first time. The prototype accelerates electrons to an energy of about 30 MeV in contrast to the LAMPF accelerator which will be used to boost protons to an energy of 800 MeV. Electrons were chosen for the EPA because they are much lighter than protons and require less energy and distance to achieve the same velocity. The electrical behavior of both particles, however, is well understood so data can be readily extrapolated from one to the other.

After the machine was being operated routinely and MP-division investigations were well under way, scientists outside of the division were invited to use it for physics research experiments. Long operating hours during these experiments were a factor in proving the reliability of the prototype's systems.

Although a prototype, the EPA is a valuable scientific tool in its own right. In its class, it

continued on next page

achieves the highest average beam current of any linear accelerator in the world. At one milliampere, its average current is twice that reached by its nearest counterpart and four to five times greater than most electron accelerators in its energy range.

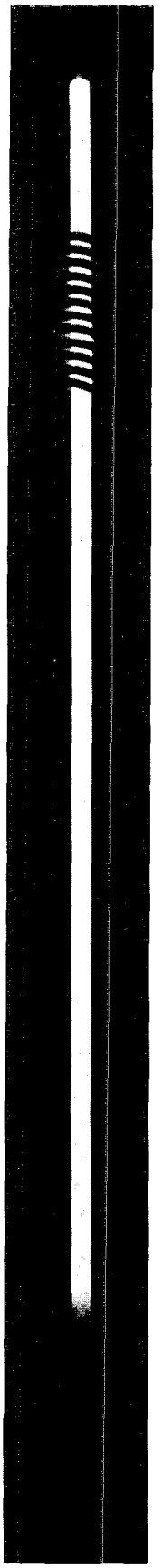
At the time it was built, electron linear accelerators had low duty factors. Much of the large amounts of power fed to them dissipates in the cavity walls causing considerable heating. For this reason, the machines require water-cooling systems and are operated in short pulses one or two millionths of a second in duration. Expressed in terms of percentage, this means the machines are turned on, or are pulsing, one-tenth of one per cent of the time. The combination of the side-coupled cavity system and development of the radio-frequency power system with high power and long pulses, however, made the EPA the first really high duty-factor accelerator. It operates at a duty factor of six per cent, which allows experimenters more time to look at reaction products.

Other features of the machine are that its design requires less electrical power and consequently fewer amplifiers because there is less power loss to cavity walls. The cavity tolerances are less demanding and can be achieved by ordinary shop practices. High electrical stability allows more cavities to be built together in one unit and to run for long hours without beam adjustment, a temperament unheard of prior to the EPA. Together these features add up to lower fabrication costs, easier maintenance, better performance and lower operating costs for EPA's big brother, now being constructed at the LAMPF site.

By wringing out of the EPA all the information possible, for the benefit of the LAMPF accelerator, MP-division officials feel they have avoided expensive revisions in the Meson Facility and have also assured tighter adherence to LAMPF scheduling which calls for an 800 MeV beam in July of 1972.

Bill Ogle, J-division leader, presents an orientation briefing on LASL's support to the Defense Nuclear Agency, during the recent visit of Army Lieutenant General Carroll Dunn, right, new director of the DNA. To the right of Ogle are Air Force Lieutenant Colonel Christopher Adams, assistant chief of staff at DNA headquarters, and Army Major Thomas Kelly, aide to General Dunn.

Heat Pipe Performs Well in a Reactor Core



The heat pipe glows against a dark background during the laboratory test.

Group N-5 scientists at the Los Alamos Scientific Laboratory have demonstrated that the performance of a lithium heat pipe is not adversely affected by the radiation environment of a nuclear-reactor core. The demonstration was an important step in determining the feasibility of a new concept in the nuclear reactor field.

The idea is to use heat pipes to transfer the tremendous amounts of heat, produced by fission in the core of a reactor, to the outside where it can be used conveniently for such applications as the generation of electrical power or to heat the bit of a nuclear subterrene, a device being developed for melting through solid rock formations.

The major attraction of the heat pipe is its capability of transferring heat with essentially no temperature drop. Temperature is an important factor in the production of electrical power since the higher the temperature, the more efficient the heat-to-electricity conversion. It is also important to the nuclear subterrene in that if all the heat produced by a reactor can be delivered to the bit, reactor power requirements can be reduced.

The heat pipe has no moving parts. In this system, heat evaporates a liquid metal. The metal fills the pipe, condenses on the inner walls and releases the heat of vaporization which is then available for use. Capillary forces in a metal wick return the condensate to the heated region of the pipe where the evaporation-condensation cycle is repeated.

Heat pipes using sodium as the working fluid have been used to cool Laboratory reactor experiments before, but under conditions where radiation effects were relatively unimportant. For this reason, the performance of high-capacity heat pipes in a reactor radiation-field had not been determined until the N-5 experiment was conducted.

The experiment was conducted in two parts. The first part consisted of a laboratory test to provide a standard against which the scientists could compare the performance characteristics of a heat pipe operating in the core of a reactor during the second part. The same heat pipe was used in the two tests and it was operated in a vacuum on both occasions.

The heat pipe used was about 40 inches long. It was made of a niobium alloy with a wick of the same material. Lithium was used as the working fluid.

In the laboratory, the pipe was placed in an evacuated quartz tube. To provide stringent test condi-

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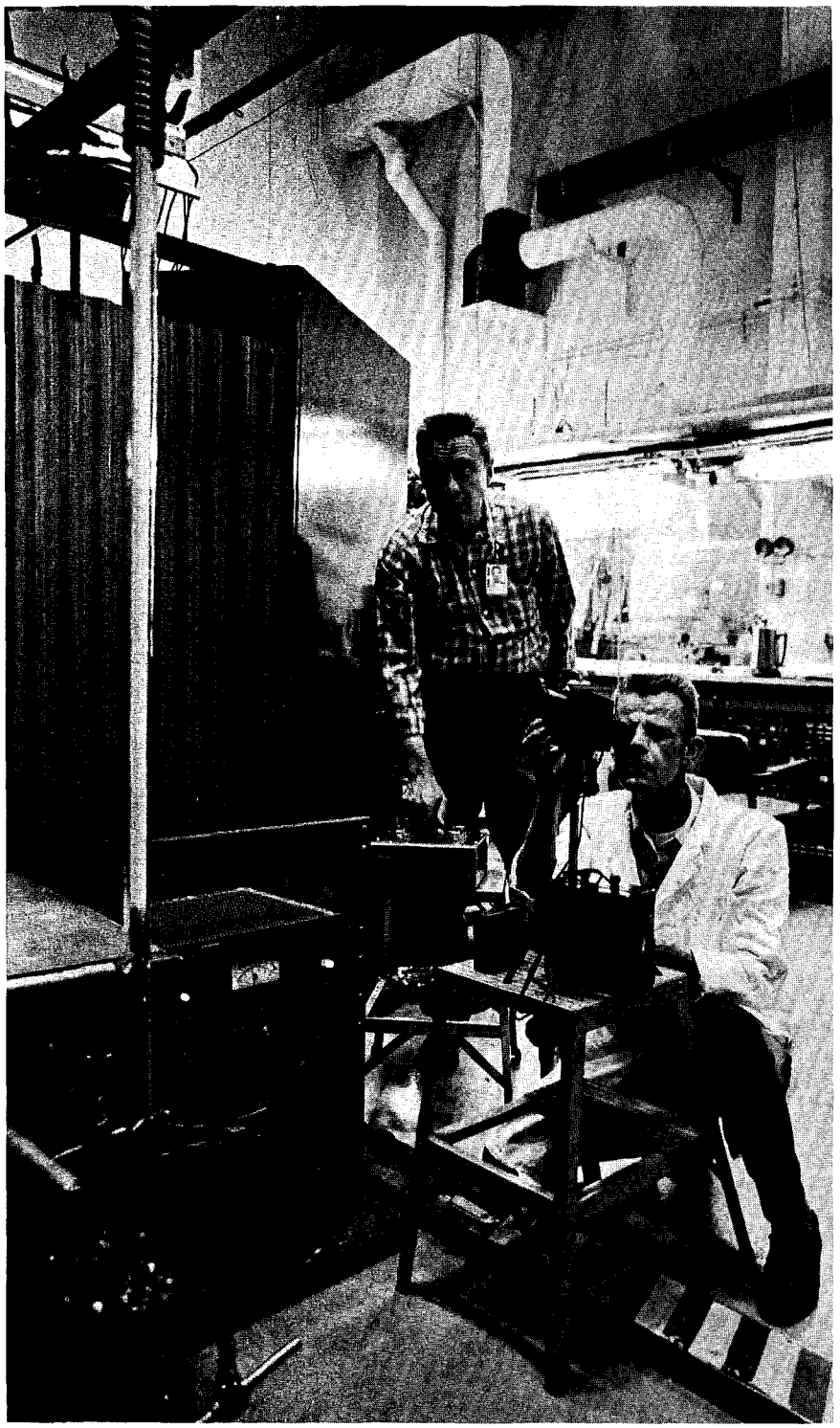
tions, heat was applied at the top of the pipe with an induction heater so that it operated against gravity. To provide the standard performance measurements to compare against the reactor test, the heat pipe was operated for several hours at temperatures ranging above 1,100 degrees centigrade.

For the reactor test, a sleeve of reactor fuel was placed around the top of the heat pipe which was then enclosed in an evacuated stainless-steel container. The container was placed in the core of the Omega West Reactor where the heat pipe successfully cooled the fuel at operating temperatures above 1,100 degrees centigrade without any adverse effects due to radiation.

The heat pipe was invented by N-5 Group Leader George Grover in 1963 for applications in space. In the recent experiment, design, construction and testing of the heat pipe was done by Joe Kemme, A. G. Vaughan and Dick Welch. Design and assembly of the reactor test facility was the responsibility of Earl Swickard, Edward Keddy, Jack Markham, and John Phillips.

Kemme noted that the next step will probably be to test sodium heat pipes in a reactor environment to determine whether they can be used to cool breeder reactors. "Although lithium is the best choice of heat-pipe working fluid for temperatures in excess of 1,000 degrees centigrade," Kemme said, "sodium is a more appropriate choice for the temperature range anticipated for breeder reactors, which is about 600 degrees centigrade." Heat-pipe cooling of breeder reactors offers several advantages compared to pumped liquid-metal coolants which will be used in the first breeder-reactor designs. These advantages relate, for the most part, to safety considerations. They include the elimination of large volumes of highly reactive liquid metals, single-component failures within the coolant system, and the possibility of reactor meltdown due to loss of part or all of the flowing coolant.



Joe Kemme increases the induction heater's power supply during the laboratory test while Dick Welch measures heat-pipe temperature with a pyrometer.

short subjects

An information meeting on the Laboratory's environmental protection program has been tentatively scheduled for Nov. 3 by the Atomic Energy Commission's Los Alamos Area Office.

Representatives have been invited from the Environmental Protection Agency, the New Mexico Environmental Improvement Agency Board, the Corps of Engineers, local government and other agencies.

The meeting will cover a survey of sources of effluents, management of solid wastes, management of liquid wastes, management of airborne wastes, management of sanitary wastes, and environmental studies.

Gerold Tenney, former employee and currently a consultant on nondestructive testing for the Laboratory, has been elected a Fellow of the American Society of Metals. He will receive the honor during the Society's 1971 Metal Show and Materials Engineering Congress in Detroit, Mich., Oct. 18-21.

In a letter to Tenney, ASM Managing Director Allan Putnam said, "The honor of Fellow represents recognition of your distinguished contributions in the field of metals and materials and develops a broadly based forum for technical and professional leaders to serve as advisors to the Society."

Tenney, who joined the Laboratory in 1944, was a technical advisor on nondestructive testing when he retired in July, 1970. He is a charter member of the Los Alamos Chapter of the American Society for Metals.

Robert Moseley, an employee of the Los Alamos Scientific Laboratory in 1951 and 1952, has been appointed assistant chairman of the University of New Mexico School of Medicine's Department of Radiology.

Jean Davis, a Laboratory employee since 1943, has been appointed to the new post of alternate equal employment opportunity officer by Director Harold Agnew.

Mrs. Davis, administrative aide for P-division at the time of her appointment, will work with Conrado Gutierrez, LASL's equal employment opportunity officer. This office is responsible to the director for all matters concerning Equal Employment Opportunity including policy and program development, Laboratory compliance with EEO regulations, and the Affirmative Action Plan for the Laboratory.

Regular monthly public tours of the Los Alamos Meson Physics Facility will be changed from the first Monday of each month to the first Saturday of each month effective Nov. 6, according to ISD-2's Bob Brashear, manager of the Bradbury Science Hall. The tours will be from 9 to 11 a.m. commencing at the Personnel building.

More than 1,000 persons have taken the public tours since they began two years ago.

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the technical side

Taken from LASL Technical Information Reports submitted through ISD-6

International Working Session on Fusion Reactor Technology, Oak Ridge National Laboratory, Tenn., June 28-July 2:

"High Field Gradient Magnets, 15 and 25 Centimeter Ambient Temperature Bore Superconducting Quadrupoles" by J. D. Rogers, P-8

"The Tritium Trick" by W. V. Green, E. G. Zukas and D. T. Eash, all CMB-13

"LAMPF (Los Alamos Meson Physics Facility) as a Neutron Source for Radiation Damage Experiments" by W. V. Green, E. G. Zukas, both CMB-13, and D. J. Dudziak, T-1

"Energy Storage and Switching with Superconductors" by H. L. Laquer, P-8, and F. L. Ribe, P-15

Twelfth Midcourse Measurements Meeting, San Diego, Calif., July 14:

"Preliminary Results from Los Alamos Far-Infrared Rocket Experiment" by A. G. Blair, P-DOR

Conference on Molecular Energy Transfer, Cambridge, England, July 19-23:

"Measurements of Vibration-Dissociation Coupling in Oxygen-Rare Gas Mixtures" by W. D. Breshears, GMX-7 (invited)

International Conference on Phonons, Rennes, France, July 26-28:

"Group Theory of Lattice Dynamics by Computer" by T. G. Worlton, Argonne National Laboratory, Ill., and J. L. Warren, P-2

Gordon Research Conference on Nuclear Structure Physics, Andover, N.H., July 26-30:

"Two Nucleon Transfer Reactions Experimental Review" by O. Hansen, P-DOR (invited)

"Polarization Phenomena — An Overview" by P. W. Keaton, Jr., P-DOR

Seventh International Conference on the Physics of Electronic and Atomic Collisions, Amsterdam, the Netherlands, July 26-30:

"The Apparent Charge Exchange Reaction Between N^+ and N_2" by E. Murad, Air Force Cambridge Research Laboratories, Mass., and W. B. Maier, II, J-10

National Bureau of Standards, Boulder, Colo., July 30:

"New Dissipation Processes in He II Film Flow" by D. H. Liebenberg, P-8 (invited)

Fifteenth International Union of Geodesy and Geophysics General Assembly, Moscow, USSR, Aug. 2-14:

"Instabilities in Finite Beta Plasmas" by D. W. Forslund, P-18

"Storm Particles in the Magnetotail, a Possible Manifestation of Magnetospheric Electric Fields During Geomagnetic Storms" by E. W. Hones, Jr., S. J. Bame, M. D. Montgomery, J. R. Asbridge, all P-4, and S. I. Akasofu, Geophysical Institute, University of Alaska, Fairbanks

"Plasma Sheet Variations During Substorms" by E. W. Hones, Jr., P-4 (invited)

1971 Intersociety Energy Conversion Engineering Conference, Boston, Mass., Aug. 3-6:

"Heat-Pipe Cooled Reactor and Heat Exchanger for Brayton-Cycle Power Systems" by T. G. Frank, G. M. Grover, R. C. Anderson, C. D. Sutherland and E. O. Swickard, all N-5

"Energy Storage and Switching with Superconductors as a Power Source for Magnetic Fields in Pulsed Thermonuclear Experiments and Reactors" by H. L. Laquer, P-8, F. L. Ribe and D. M. Weldon, both P-15

International Federation of Automatic Control Symposium on the Operator, Engineer, and Management Interface with the Process Control Computer, Purdue University, Lafayette, Ind., Aug. 3-6:

"Use of an Interactive Display System in Multi-Computer Van de Graaff Accelerator Control System" by M. W. Collins, C-2, and D. E. McMillan, P-9

Symposium on Distribution and Measurement of Plutonium in the Environment, Los Alamos, Aug. 4-5:

"Plutonium Distribution as a Problem in Environmental Science" by W. H. Langham, H-4

"Some Thoughts on Plutonium in Soils" by J. W. Healy, H-DO

"Distribution of Plutonium from Accidents and Field Experiments" by H. S. Jordan, H-8

"Solubility of $^{238}PuO_2$ in Los Alamos Tap Water" by W. H. Adams, H-7

"^{238}Pu Incorporated in Fish Living in Water Containing $^{238}PuO_2$" by W. H. Adams and E. B. Fowler, both H-7

"More on the Pu Particle Size Problem" by J. R. Buchholz, W. H. Adams, C. W. Christenson and E. B. Fowler, all H-7

"Summary of a Study of the Uptake of ^{239}Pu by Alfalfa from Soils" by J. R. Buchholz, W. H. Adams, C. W. Christenson and E. B. Fowler, all H-7

"Separation and Analysis of Plutonium in Soil" by G. E. Bentley, W. R. Daniels, G. W. Knobeloch, Francine O. Lawrence and Darleane C. Hoffman, all CNC-11

Fourth International Conference on Amorphous and Liquid Semiconductors, Ann Arbor, Mich., Aug. 8-13:

"Localization of Electron Wave Functions in Disordered Systems" by W. M. Visscher, T-9

Defense Nuclear Agency High Altitude Nuclear Effects Symposium, Stanford Research Institute, Menlo Park, Calif., Aug. 10-12:

"Birdseed High Altitude Experiments" by D. M. Kerr, J-10

"Historical Survey of Work on Microcoupling Problem" by D. W. Forslund and R. L. Morse, both P-18

"Striation Behavior" by S. R. Goldman, J-10

"Present Understanding of the Starfish Event" by H. W. Hoerlin, J-DOT (invited)

"An Interpretation of the Debris Energy Patch in Starfish" by J.

Zinn and M. S. Tierney, both J-10

"Applications of the ICE Method to Studies of Low Altitude Explosions" by R. A. Gentry, T-3 (invited)

"Laboratory High-Altitude Effects Simulation" by S. R. Goldman and R. A. Jeffries, both J-10, and I. Henins, P-17

"Numerical Comparisons Between an ICE Code and Mobile" by E. M. Jones, J-10

"IR Simulation Experiments" by R. J. Jensen, J-10

"Time-Dependent Neutron Deposition and Air Ionization from Sprint" by W. H. Roach, J-10

"Modeling of Early-Time Phenomenology of Low Altitude Bursts" by G. A. Shelton, J-10

"Analysis of Late-Time Checkmate Striations" by H. M. Peek, J-10, and W. B. Broste and J. J. Walker, both EG&G, Los Alamos

"Computer Studies of Atmospheric Phenomena Following Nuclear Explosions" by W. B. Maier, II, and C. D. Sutherland, both J-10

"Chemical-Kinetic Considerations in Atmospheric Recovery for a 2 Mt, 20 Kilometer Altitude Nuclear Burst" by F. P. Hudson, Sandia Laboratories, Albuquerque, and M. Stammler, formerly J-10

"A '2-Fluid' Calculation of a 300 km Spartan Explosion Including Charge Exchange Effects and Debris Deposition at the Conjugate" by M. S. Tierney and J. Zinn, both J-10

"Effects of Electron, Cyclotron Turbulence Bomb Debris Motion and Electron Heating" by D. W. Forslund, R. W. Mitchell, R. L. Morse and C. W. Nielson, all P-18

"Endoatmospheric Blackout and Offense Penetrating Fuzing Systems" by W. C. Lyons and E. W. Salmi, both W-9, and C. R. Blaine, Sandia Laboratories, Albuquerque

"Status of LASL Output Calculations" by G. R. Spillman, TD-3

Twentieth Annual Denver Conference on Applications of X-Ray Analysis, Denver, Colo., Aug. 11-13:

"The Effects of Self-Irradiation on the Lattice of ^{238}(80%) PuO_2" by R. B. Roof, Jr., CMB-5

"X-Ray Spectral Distributions from Thick Tungsten Targets in the Energy Range 12 to 300 kV" by E. Storm and H. I. Israel, both H-1, and D. W. Lier, J-14

American Society of Mechanical Engineers-American Institute of Chemical Engineers National Heat Transfer Conference, Tulsa, Okla., Aug. 15-18:

"Radial Flow Measurements of Hydrogen Near Its Critical Point in a Heated Cylindrical Tube" by M. T. Wilson, MP-6, V. J. Skoglund, University of New Mexico, Albuquerque, and J. D. Rogers, P-8

Seminar, Cold Spring Harbor Laboratory of Quantitative Biology, N. Y., Aug. 16:

"Constancy of DNA in Heteroploid Cells" by D. F. Petersen, H-4 (invited)

Seminar, Sacramento Peak Observatory, Sunspot, N.M. Aug. 16:

"Heavy Ions and Electrons in the Solar Wind" by M. D. Montgomery, P-4 (invited)

Conference on Nucleation of Quantized Vortices, Boulder, Colo., Aug. 16-18:

"Oscillations and Dissipation in the Flow of Saturated Films of Superfluid Helium" by L. J. Campbell, J. C. Fraser, E. F. Hammel, J. K. Hoffer, W. E. Keller and R. H. Sherman, all P-8

"Interpretation of Third Sound in Terms of the Superfluid Parameters of Thin Helium Films" by J. C. Fraser, P-8, and I. Rednick, University of California, Los Angeles

"New Dissipation Processes in He II Film Flow" by D. H. Liebenberg, P-8 (invited)

Third International Symposium on the Packaging and Transportation of Radioactive Materials, Richland, Wash., Aug. 16-20:

"Processing Radioactive Shipments from the Standpoint of Radiation Safety" by C. W. Buckland, Jr., H-1

"Computer Movies for Simulation of Mechanical Tests" by L. H. Baker, B. J. Donham, W. S. Gregory and E. K. Tucker, all ENG-7

Conference, Committee on Hazardous Materials, National Research Council, Houston, Texas, Aug. 18:

"Technology and Safety—A Qualitative View" by R. Reider, H-3

Briefing lecture series, Brooks Air Force Base, Texas, Aug. 19:

"General Aspects of the Plutonium Environmental Problem with Emphasis on Response to Inhaled Plutonium Particles" by W. H. Langham, H-4 (invited)

Seminar, University of Alberta, Edmonton, Alberta, Canada, Aug. 20:

"Carbon-13 NMR Studies of Metal Ion Chelate Complexes in Solution" by N. A. Matwiyoff, CNC-4

Twelfth International Conference on Cosmic Rays, Hobart, Tasmania, Australia, Aug. 23:

"Dependence of the Neutron Monitor Attenuation Coefficient on Atmospheric Depth and on Geomagnetic Cutoff in 1966 and in 1970" by H. Carmichael, Atomic Energy of Canada Limited, Chalk River Nuclear Laboratories, Ontario, and R. W. Peterson, J-16

International Conference on Statistical Properties of Nuclei, State University of New York, Albany, Aug. 23-27:

"High Resolution Neutron Cross Sections" by M. S. Moore, P-3

"Fluctuations in Charged Particle Cross Sections" by W. R. Gibbs, T-5 (invited)

Gordon Research Conference, Beaver Dam, Wisc., Aug. 23-27:

"Absorption of Laser Light in Plasmas" by R. L. Morse, P-18

"LASL Laser Program Status" by K. Boyer, J-DO

Tritium Symposium, jointly sponsored by the Southwestern Radiological Health Laboratory of the U. S. Public Health Service, the Environmental Protection Agency, and the University of Nevada, Las Vegas, Aug. 30-Sept. 2:

"Analysis of Distillates for Tritium Using Linear Regression" by W. D. Moss, E. E. Campbell and B. C. Eutsler, all H-5

"Tritium Loss from Coated Cement Paste Blocks" by L. A. Emelity, C. W. Christenson and J. J. Wanner, all H-7

Air Force Satellite Control Facility, Sunnyvale, Calif., Aug. 31:

"Some Results of the Vela Energetic Particle—ST Detector Experiment" by S. Singer, P-4 (invited)

20 years ago in los alamos

Culled from the Oct., 1951, files of the Los Alamos Herald by Robert Porton.

Meteorological Study Disclosed

A continuing evaluation project for meteorological and blast wave studies at the Nevada Test Site was announced by the AEC. The study of blast waves under various atmospheric conditions will continue for several months. The meteorological studies are to obtain detailed data for anticipating atmospheric conditions during test operations and to study the effects of temperature inversions and upper air winds on blast waves.

Cross-Sections Committee Meeting Here

A meeting of the Cross-Sections Committee of the Atomic Energy Commission will be held in Los Alamos. The committee is composed of staff members of the various AEC laboratories. Conferences are held to discuss the problems involved in measuring neutron cross-sections and to compile data. George Kolstad will attend from the AEC, Washington, and Richard Taschek and Carroll Zabel will represent LASL.

Civic Club Schedules Fall Formal

The presentation of trophies will highlight the Los Alamos Civic Club's fall formal dinner-dance. Arnie Roensch and his orchestra will provide the music for the annual event which is for members and out-of-town guests. Chef Gus Pamatat has promised something special for the dinner menu. Seven golf trophies will be presented to members of the Civic Club bowling team. (sic)

De Seversky will Speak in Los Alamos

Major Alexander de Seversky will speak at the Civic Auditorium in the second program of the Los Alamos Town Forum Association's 1951-52 season. In his latest book, "Air Power—Key to Survival," de Seversky exhorts the American public to an awareness of the need for a realistic decision on military strategy. His thesis is that this nation can maintain peace, or achieve victory in war, only if it develops invincible airpower.

what's doing

PUBLIC SWIMMING: High School Pool—Monday through Wednesday, 7:30 to 9 p.m., Saturday and Sunday, 1 to 6 p.m., Adult Swim Club, Sunday, 7 to 9 p.m.

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leaders for information.
- Oct. 9-11—Canyon de Chelly, Ariz., Ken Ewing, 662-7488.
- Oct. 23-25 Betatakin and Keet Seel, Ariz., Ed Kmetko, 662-7911.
- Oct. 30—Back gate to Dixon's Apple Orchard (20 miles), Reed Elliott, 662-4515.

SIERRA CLUB: Luncheon meeting at noon, first Tuesday of each month, South Mesa Cafeteria. For information call Brant Calkin, 455-2468, Santa Fe.

LOS ALAMOS FILM SOCIETY: 7:30 p.m., Civic Auditorium. Admission: members—$.50, others, $2.
- Oct. 27—"To Die In Madrid."

RIO GRANDE RIVER RUNNERS: Meetings scheduled for noon, second Friday of each month at South Mesa Cafeteria. For information call Joan Chellis, 662-3836.

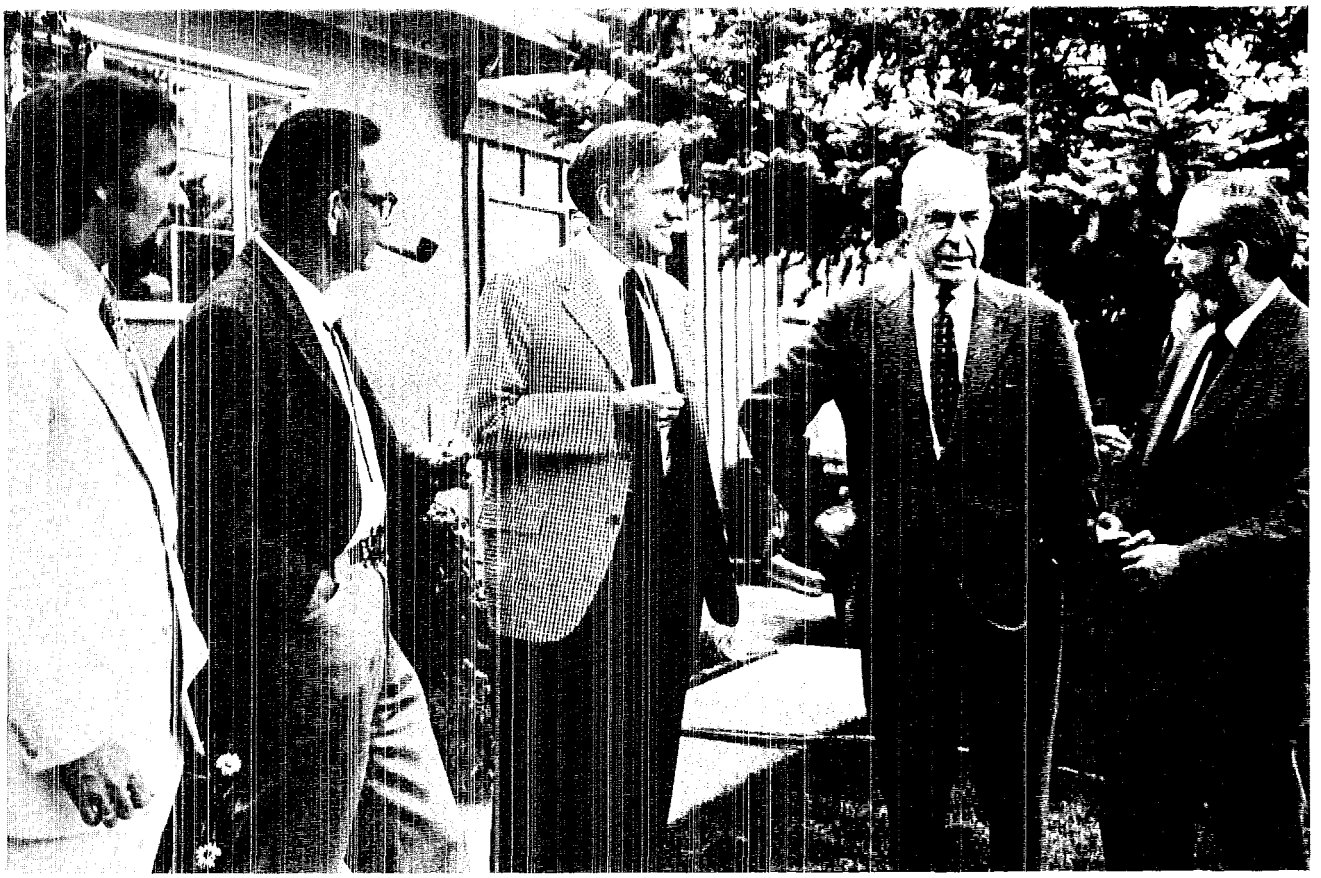
LOS ALAMOS SAILORS: Meetings at noon, South Mesa Cafeteria, first Friday of each month. For information call Dick Young, 662-3751.

MOUNTAIN MIXERS SQUARE DANCING CLUB: For information call Mrs. Florence Denbow, 662-5014.
- Oct. 2—Mesa School, Raymond Rogers, Albuquerque, caller.
- Oct. 16—Mesa School, "Bones" Craig, Los Alamos, caller.

MESA PUBLIC LIBRARY:
- Through Oct. 12—AAUW native dye exhibit.
- Through Oct. 22—New Mesa Library prints exhibit (circulating collection).
- Oct. 13 to Nov. 19—Cartoons on conservation.
- Oct. 25 to Nov. 15—UNICEF annual display.
- Oct. 25 to Nov. 22—Gayle Fulwyler, water color, and pen and ink sketches.

NEWCOMERS CLUB: Oct. 27, fashion show and card party, 7:30 p.m., Fuller Lodge. For information call Sally Jacoby, 662-4862.

LOS ALAMOS OPERA GUILD: Santa Fe Opera benefit, Lili del Castillo and Company, flamenco. Oct. 15, 8:15 p.m., Civic Auditorium. Admission: $2.50, adults; $1.50, students (18 and under).



Jack Westland, second from right, former Washington Congressman who was recently appointed by President Nixon as the Federal Representative to the Western Interstate Nuclear Board, and the Board's executive director, Alfred Whatley, right, were recent visitors at the Laboratory. They are shown with Harry Otway, J-DOT, Bill Ogle, J-division leader, and LASL Director Harold Agnew at the Agnew home.

Henry T. Motz
3187 Woodland
Los Alamos, New Mexico 87544

Robert Duffield, director of the Argonne National Laboratory, talks with LASL staff members after his talk on "Can We Make Energy Acceptable" at a Laboratory colloquium. Talking with Duffield are Raemer Schreiber, LASL's technical associate director, John Manley, research advisor, and Henry Motz, P-division leader.